

Regional Climate Services



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Regional Climate Services Director

NOAA – National Centers for Environmental Information

August 11th, 2021



United States Department of Agriculture
Midwest Climate Hub



Regional Climate Services

The development and delivery of climate information and services that are on time and spatial scales needed most by decision-makers

Development and Delivery: requires an end-to-end system that links research, modeling and assessment activities to product and services development, along with delivery systems and capacity building to help users incorporate new knowledge into their decision making.

Products and Services: climate information and decision support tools that expand one's understanding of risk and impacts and promote identification of adaptation and mitigation options

Time and spatial scales: climate impacts are felt closest to home. Users need timely, place-based information on climate risks and impacts in order to make informed decisions.

Decision-makers: users of climate information representing all public and private sectors of activity. These are the climate stakeholders.

Regional Climate Information Delivery in Real-Time

- * **Monthly Summary/Outlook Webinars (10 years)**
- * **Climate Briefs**
 - * Quarterly Climate Summaries
 - * Extremes Briefs
 - * Periodic Briefs (El Niño, La Niña, etc...)
 - * Short Fuse (Weeks 2 through 4)
- * **Some national climate tools (National Centers for Environmental Information - NCEI)**
 - * New Normals (1991-2020)
 - * State of the Climate
 - * Climate at a Glance
 - * Billion \$\$ Disasters

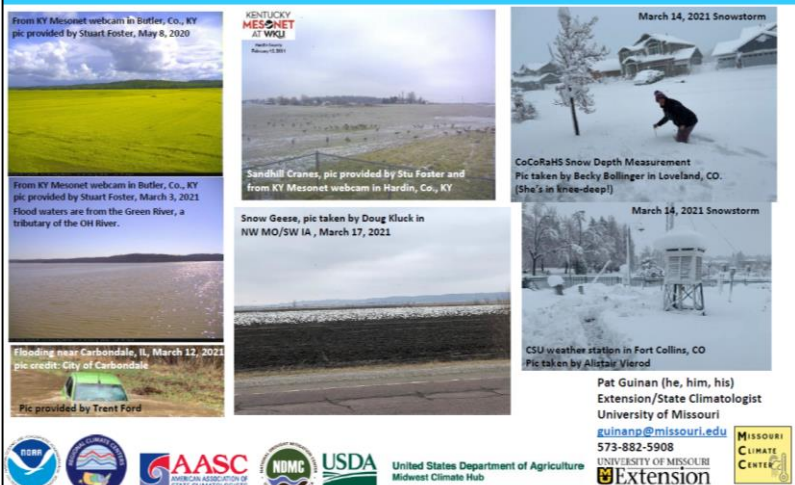
Monthly North Central Regional Climate Webinars

Real-Time Regional Climate Support

- **Past, Current, Future**
 - Highlights past events, trends and anomalies
 - Outlooks with potential impacts (week 2 – 6months)
 - Q&A with “experts”
- 1200 registered, 15,000 served
- Presenters: State Climate Offices, NDMC, USDA
- 16 states from Great Lakes to the Rockies

Sign up here: <https://attendee.gotowebinar.com/register/7528179497868100876>

Central Region Climate and Drought Outlook March 18, 2021



From KY Mesonet webcam in Butler, Co., KY
pic provided by Stuart Foster, May 6, 2020

KENTUCKY MESONET AT WKU

Sandhill Cranes, pic provided by Stu Foster and from KY Mesonet webcam in Hardin, Co., KY

From KY Mesonet webcam in Butler, Co., KY
pic provided by Stuart Foster, March 3, 2021
Flood waters are from the Green River, a tributary of the OH River.

Floodwaters near Carbondale, IL, March 17, 2021
pic credit: City of Carbondale
Pic provided by Trent Ford

Snow Geese, pic taken by Doug Kluck in NW MO/SW IA, March 17, 2021

March 14, 2021 Snowstorm

CoCoRaHS Snow Depth Measurement
Pic taken by Becky Bollinger in Loveland, CO. (She's in knee-deep!)

March 14, 2021 Snowstorm

CSU weather station in Fort Collins, CO
Pic taken by Alastair Viorod

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MISSOURI CLIMATE CENTER

NOAA
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United States Department of Agriculture
Midwest Climate Hub

Midwest and Great Plains Climate and Drought Outlook

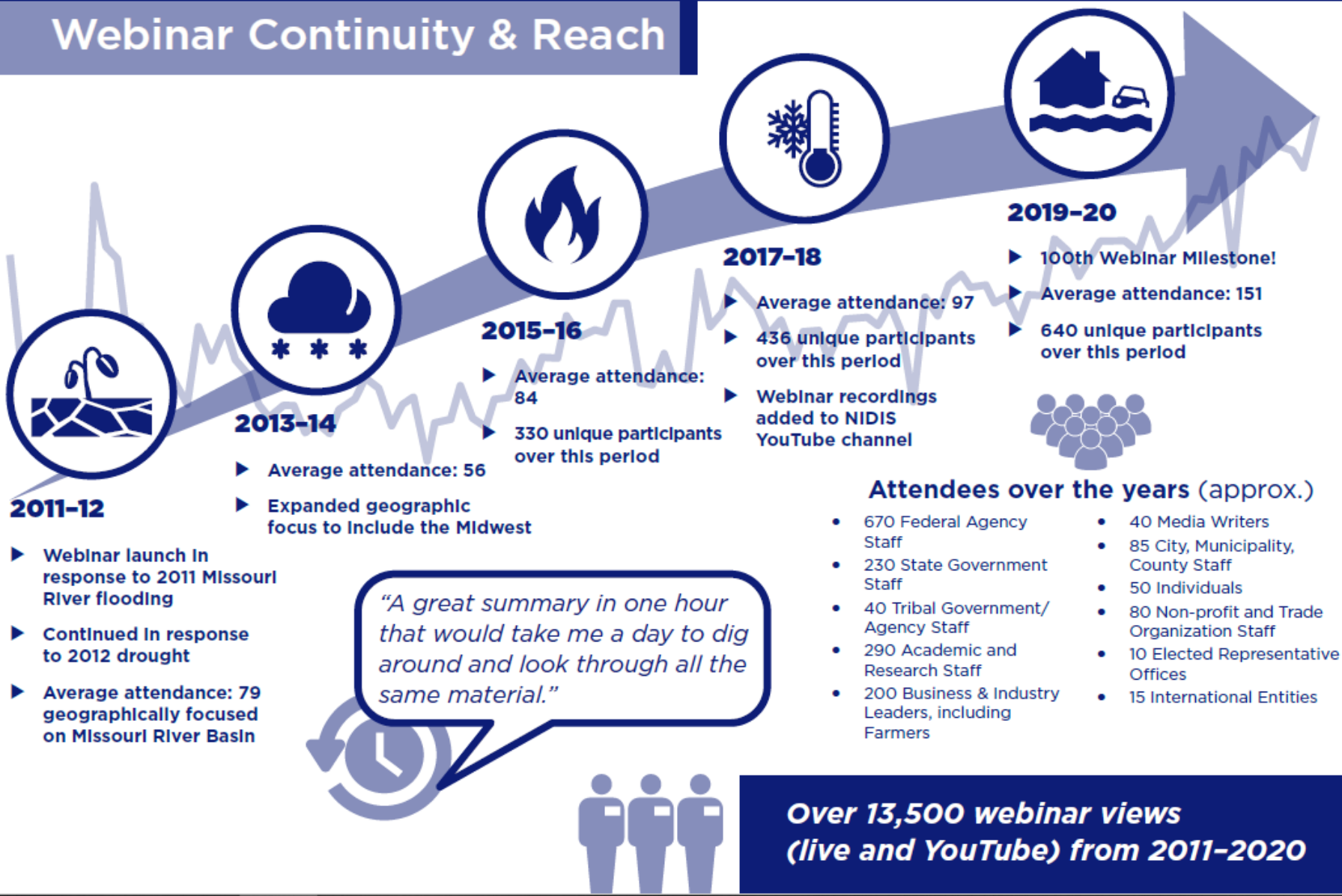


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NOAA
USDA
United States Department of Agriculture
Midwest Climate Hub
AASC
AMERICAN ASSOCIATION OF STATE CLIMATOLOGISTS
National Drought Mitigation Center
THE OHIO STATE UNIVERSITY

The North Central U.S. Monthly Climate and Drought Summary and Outlook

Webinar Continuity & Reach



Regional Climate Support: Routine Briefs

* Quarterly Regional briefs

- * Single page
- * Past, Present, Future
- * Non-technical

* Event Based

- * ENSO or Extreme
- * Non-technical
- * As needed
- * Potential regional impacts
- * High interest

* Multi-Partner Efforts

Quarterly Climate Impacts

Midwest Region

Drought Impacts

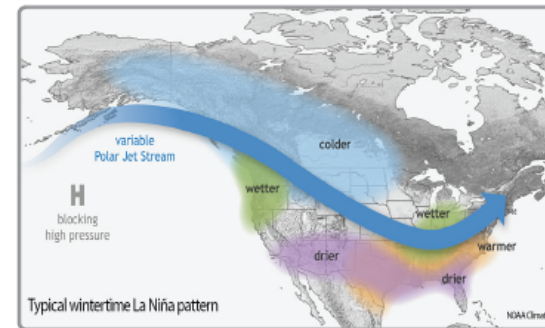
Northern Plains

La Niña Impacts and Outlook

Midwest Region

October 2020

Typical La Niña Winter Pattern



The image above shows the typical pattern in the winter during La Niña events. The polar jet stream tends to stay to the south of the Great Lakes region, while the Pacific jet stream tends to track closely along the Pacific Northwest, bringing increased chances for moisture.

Image courtesy of the National Oceanic and Atmospheric Administration.

Highlights for the Midwest

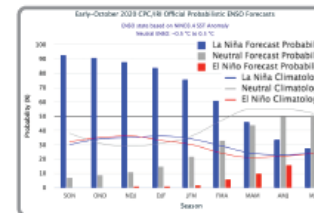
A La Niña develops when sea surface temperatures are cooler than average in the eastern equatorial Pacific for an extended time. This is important to North America because La Niña can impact our weather patterns, especially in the winter.

While no two La Niña events are alike, there are some general tendencies that emerge. For instance, the polar jet stream is typically farther south than usual.

This pattern brings enhanced chances for below-normal temperatures to the upper Midwest, particularly in the more western areas. The Ohio River Valley also sees enhanced chances of wetter-than-normal conditions, particularly for late winter. Warmer or drier weather events can still occur, but those events may be milder and less frequent across the basin.

La Niña Outlook

La Niña Probability Winter 2020-2021



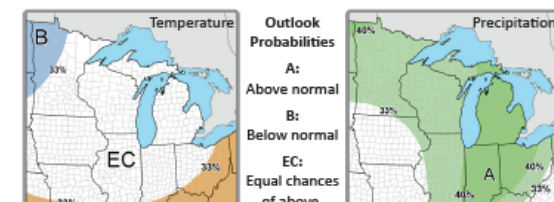
La Niña conditions have continued this fall and forecasts indicate that this La Niña will strengthen, peaking as a moderate or even strong event in late fall or early winter. According to the Climate Prediction Center, there is a greater than 85% chance that these conditions will last through the winter and about a 60% chance that La Niña will continue into the early spring.

Winter Temperature and Precipitation Outlooks

The winter temperature outlook (issued in October) indicates that the northwestern corner of the region has slightly increased chances of below-normal temperatures, while the southern parts of the region have slightly increased chances for above-normal temperatures.

Precipitation outlooks for the region show increased chances of above-normal precipitation for the Great Lakes region. There are equal chances of above-, below-, and near-normal precipitation for much of Iowa and Missouri, along with small areas of Minnesota, Illinois, and Kentucky.

Outlooks Valid for December 2020 - February 2021



Extreme (climate) Events Briefs

Extreme Wetness of 2019

Missouri River Basin

April 2020



The Platte River, between Columbus and Schuyler, Nebraska, in June 2019. Photo courtesy Jim Hoppe.

The Historic Year of 2019

Summary

In 2019, precipitation and flooding reached historic levels in the Missouri River Basin. Starting in March with the "bomb cyclone" event, portions of the Missouri River and its tributaries were above flood stage for the majority of the year. Impacts from the heavy precipitation and subsequent flooding were widespread. Communities were evacuated. Farmland was inundated. Critical infrastructure, such as roads, bridges, and levees, were damaged or destroyed. The mental toll from these events is ongoing. Ultimately, 16 major disasters were declared across the region due to the weather and climate events of 2019. Although the calculation of losses is not finalized, the total certainly will reach into the billions of dollars.

In this Report

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50+
record river
crests

125+
precipitation
records

300+
days in flood

Contact: Natalie Umphlett (umphlett2@unl.edu)
Doug Kluck (doug.kluck@noaa.gov)
Dennis Today (dennis.today@usda.gov)



Extreme Wetness of 2019 | April 2020
<https://hprcc.unl.edu/pdf/2019Extremes.pdf>

Extreme Wetness of 2019

Midwest Region

April 2020

Overview of Events – Midwest Region Heavy Precipitation and Flooding of 2019



Historic rainfall and flooding affected the Midwest* in 2019. Regionwide rainfall totals were more than 3 inches above the previous record year of 2018, and the prior record from 1993. The record rainfall was partially due to major events but an additional factor was the number of days with precipitation. A total of 121 stations set annual records in 2019, and the 2-year totals at 266 stations set new records for 2018–2019.



Flooding hit major levels on all the major river systems including the Missouri, Mississippi, and Ohio along with many of the tributaries. Flooding also persisted throughout much of the year on the Missouri and Mississippi in particular. Along the Iowa-Illinois border, the Mississippi River topped major flood stage multiple times. One occasion lasted for 51 days at Rock Island, much longer than any previous major flood in its history.

*Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.

By the Numbers – 2019 in Context

95

Counties across the Midwest, at least one in each of the nine states, with crop indemnity losses topping \$10 million each.

15

Weeks without drought and abnormally dry conditions across the region. In the preceding 19 years, only two such weeks were recorded.

32

Straight weeks (January through July) with no drought in the Midwest. The previous record streak was 14 weeks, set in 2016.

2nd Consecutive year setting a new annual precipitation record for the Midwest region.

3

Weeks of delayed planting and crop development during the 2019 growing season due to weather.

51

Straight days above major flood stage and a new record crest at the Quad Cities.

3

Major river systems (Mississippi, Missouri, and Ohio) in the region that reached major flood stage in 2019.

Contact: Mike Timlin (mtimlin@illinois.edu)
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Dennis Today (dennis.today@usda.gov)



Extreme Wetness of 2019 | April 2020
<https://mrcc.illinois.edu/pubs/docs/MW-2019ExtremeWetness.pdf>

Short Fuse Extreme Events: Partnership w/USDA

* “Real-time” regional briefs:

- * *2-4 weeks in advance*
- * *Critical impacts, potential extremes*
- * *NOAA climate/weather information*
- * *USDA climate/weather impacts to agriculture*

* Current Extremes due to past conditions

- * Warmth/wet/dry/cold

* Critical Timing:

- * Fall harvest, fall/summer early freezes, spring late freezes
- * pollination/seed filling
- * spring livestock
- * spring fire
- * growing season drought, spring planting



NOAA Inputs: Late Season Cold, Wet, Snow (preceded by anomalous warmth)

NOAA, NCEI, USDA, HPRCC, MFCO

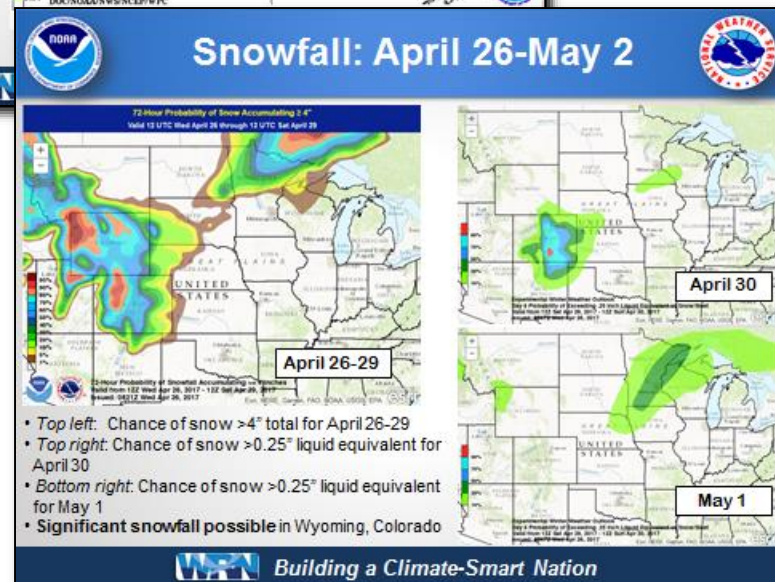
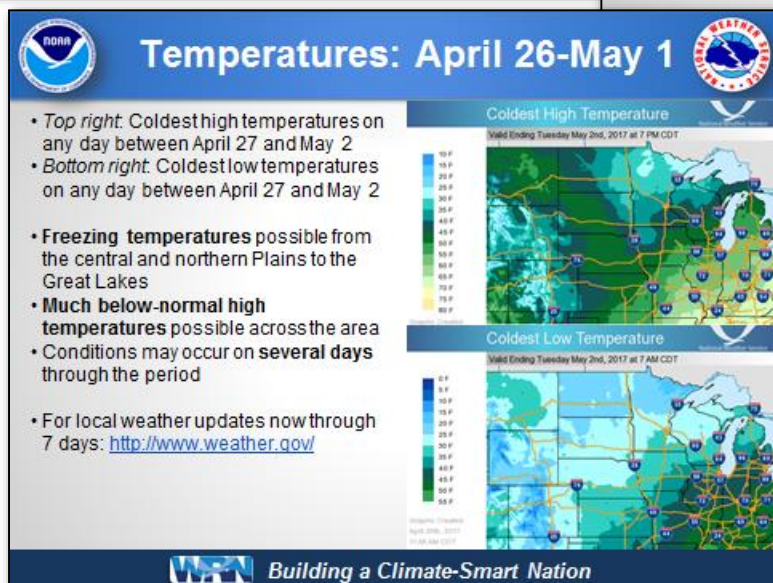
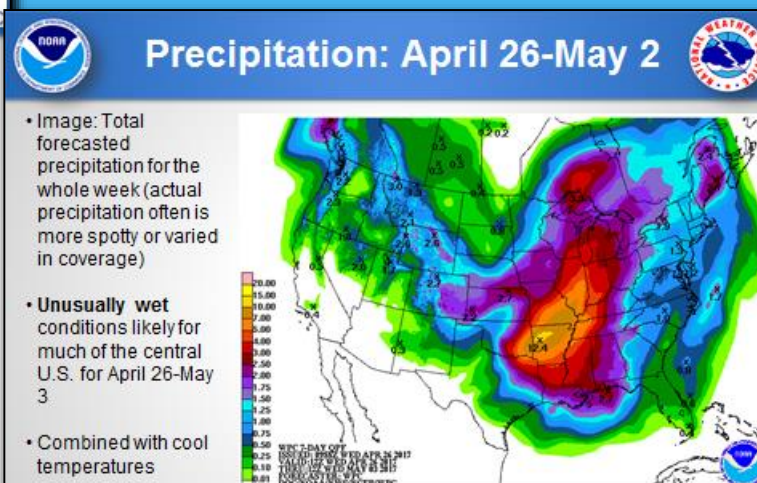
Major Cold and Wet Spring Event: Potential Impacts in the North Central U.S. April 26-May 9, 2017

Prepared By:
Barb Mayes Boustead, Ph.D.
Meteorologist and Climatologist, National Weather Service


Dr. Dennis Today
Director – USDA Midwest Climate Hub

In Partnership With:
Doug Kluck (NOAA/National Centers for Environmental Information), Dannele Peck (USDA Northern Plains Climate Hub), Crystal Stiles (High Plains Regional Climate Center), Mike Timlin (Midwestern Regional Climate Center), Ray Wolf (National Weather Service)


Building a Climate-Smart Nation





USDA Inputs: Event Dependent





Impacts




Freeze:


- Wheat growth
- Apple and other fruit tree blooms
- Home gardens and landscaping


Cold and Rain:

- Corn planting and seed germination
- Livestock health, especially calves
- Soil compaction and nutrient loss
- Inaccessible fields







Building a Climate-Smart Nation



Impacts - Crops






Freezing conditions:

- Wheat, horticultural, fruits, perennials most at risk based on development (different risk temperature at different stages: fruits, wheat)
- Freeze risk management very likely
- Exposed home vegetation need to monitor forecasts


Cold conditions:

- Most field crops less risk of freeze, more risk sitting in cold soils
- Slow crop development
- Increased disease risk
- Replant may be necessary


<http://crops.extension.iastate.edu/cropnews/2012/05/im-bibitional-chilling-and-variable-emergence>

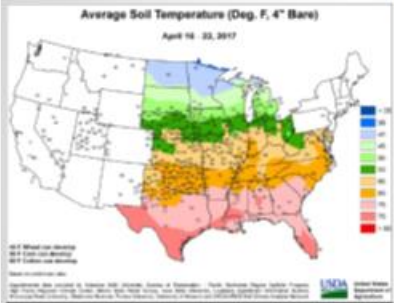


Building a Climate-Smart Nation



Impacts - Soils





Temperature:

- Continuous cold, wet soil and cloud cover will keep soils very cool


Moisture:

- Flooded fields/slow field access
- Contribute to nutrient loss
- Increased crop disease issues
- Impact root growth

Risk:

- Likely delay additional planting
- Heaviest rain expected southern/eastern Corn Belt
- Most plains and Midwest will likely have some wetness

USDA Weekly Weather and Crop Bulletin



Building a Climate-Smart Nation



Impacts - Livestock





Cold, Rain, Winds:

- Young livestock should be monitored because of prolonged cold/wet conditions over the 1-2 weeks
- Snow accumulations could add to risk in Plains, northern states





Building a Climate-Smart Nation

National Centers for Environmental Information

- Responsible for hosting and providing access to one of the most significant archives on Earth, with comprehensive oceanic, atmospheric, and geophysical data
- From the depths of the ocean to the surface of the sun and from million-year-old sediment records to near real-time satellite images
- Nation's leading authority for environmental information



NCEI products span from local to global, and weekly to decadal scales

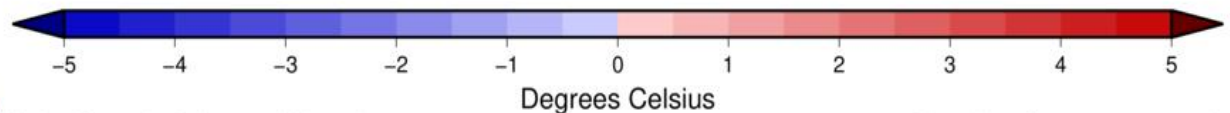
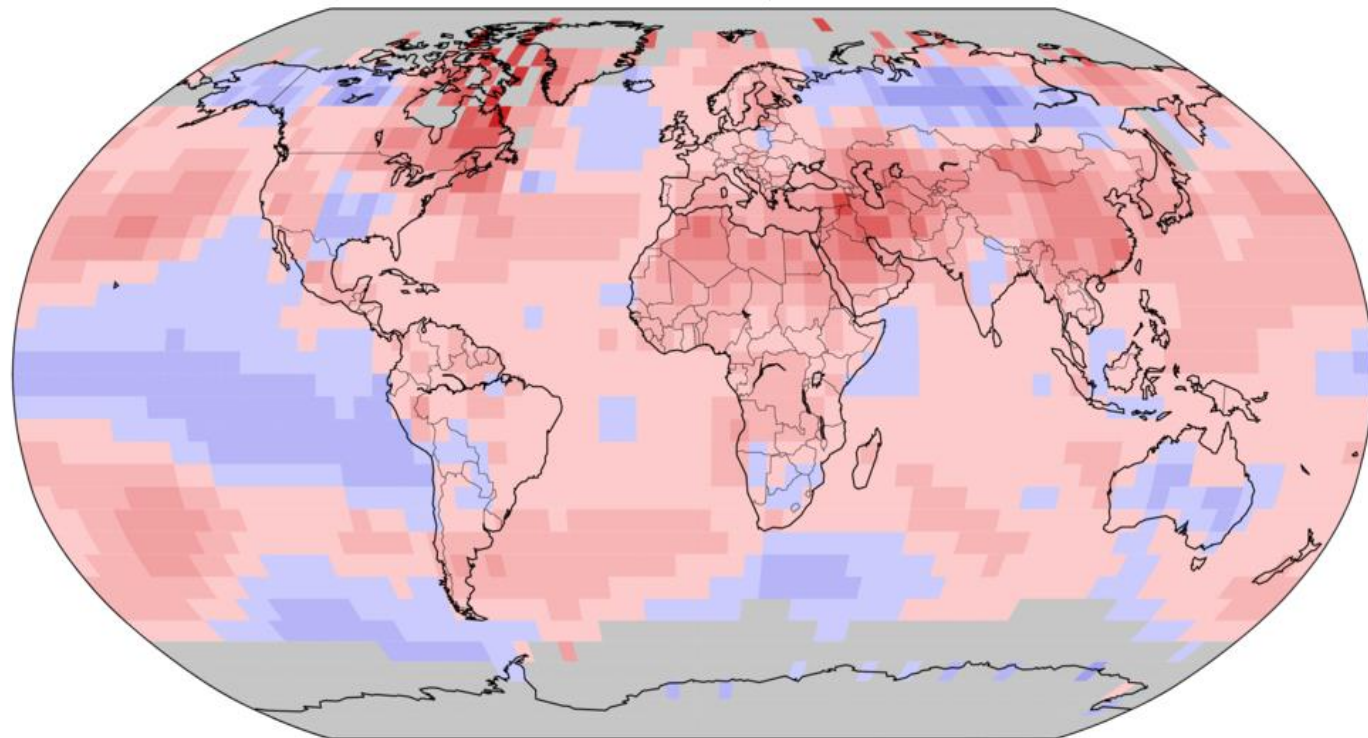


Monitoring the Climate (Earth)

State of the Climate/Climate at a Glance

Land & Ocean Temperature Departure from Average Jan–Jun 2021
(with respect to a 1981–2010 base period)

Data Source: NOAAGlobalTemp v5.0.0–20210707



National Centers for Environmental Information
GHCNM v4.0.1.20210706.qfe

Please Note: Gray areas represent missing data
Map Projection: Robinson



RANK	1 = WARMEST	YEAR	ANOMALY °C	ANOM
1		2016	0.99	1.78
2		2020	0.98	1.76
3		2019	0.95	1.71
4		2015	0.93	1.67
5		2017	0.91	1.64
6		2018	0.83	1.49
7		2014	0.74	1.33
8		2010	0.72	1.30
9 (tied)		2005	0.67	1.21
9 (tied)		2013	0.67	1.21

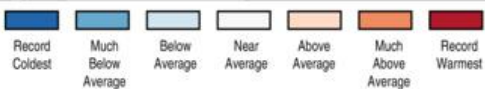
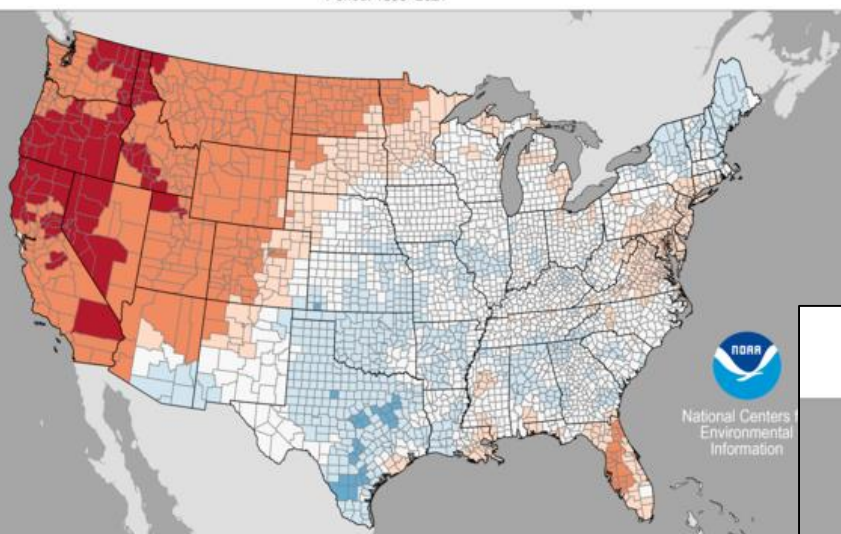
Monitoring the Climate

State of the Climate/Climate at a Glance

County Average Temperature Ranks

July 2021

Period: 1895–2021



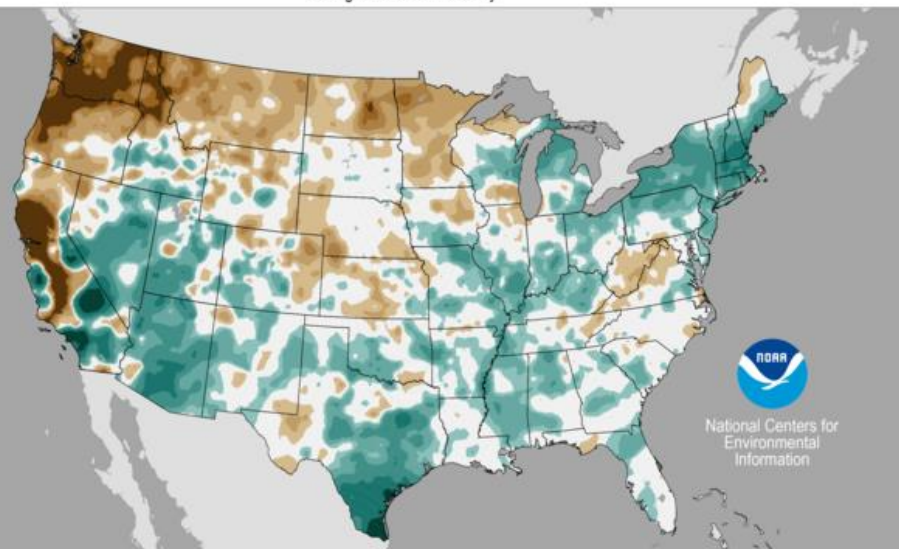
Thu Aug 05 2021

Data Source

Precipitation Percent of Average

July 2021

Average Period: 20th Century



Created: Thu Aug 05 2021

Percent

Data Source: nClimGrid

Average, Maximum, Minimum Temps

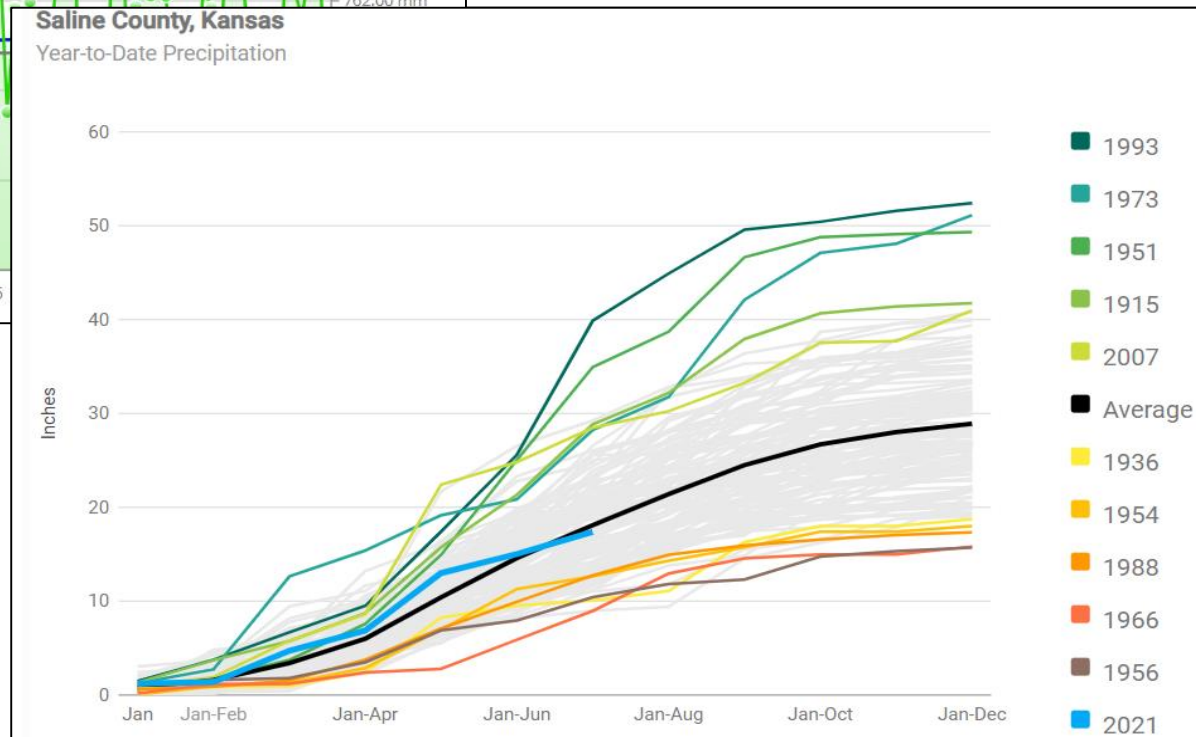
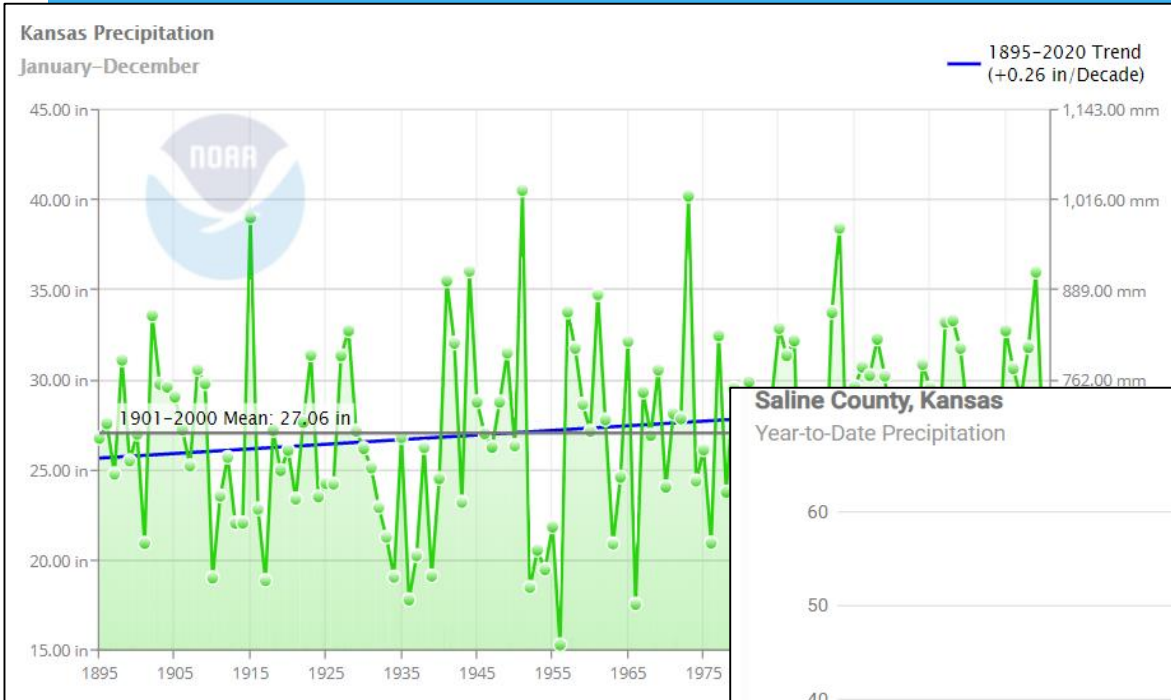
Climate divisions, counties, states,
regional

<https://www.ncdc.noaa.gov/sotc/>

<https://www.ncdc.noaa.gov/cag/>

Monitoring the Climate

<https://www.ncdc.noaa.gov/sotc/>



<https://www.ncdc.noaa.gov/cag/>

The New Normals (15 & 30 year) (1991-2020)

- * Conventional Climate Normals: standard 30-year averages and statistics of weather observations
- * A baseline for putting today's weather in proper context
 - * NOAA National Weather Service
 - * Broadcast Meteorology (media)
- * Understanding today's climate for decision making:
 - * Energy
 - * Agriculture
 - * Construction and Design
 - * Retail
 - * Travel
 - * Business and Industry
 - * Water Resources

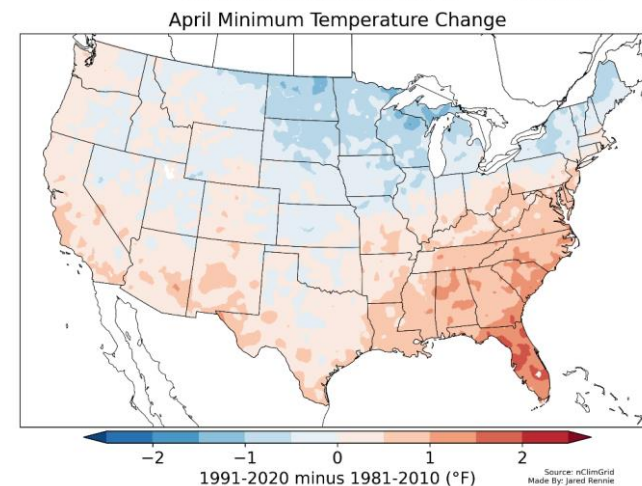
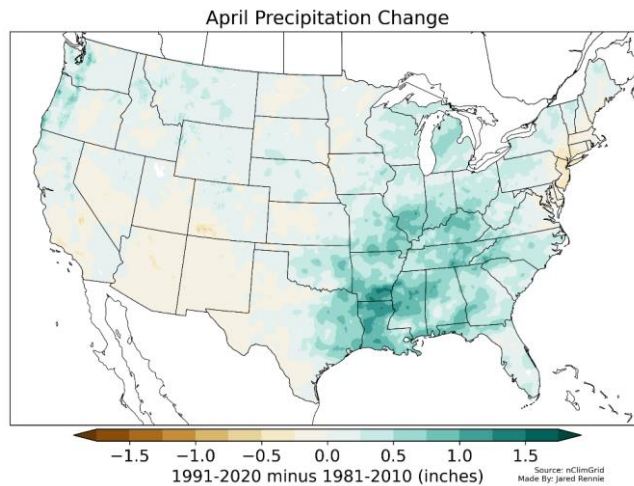
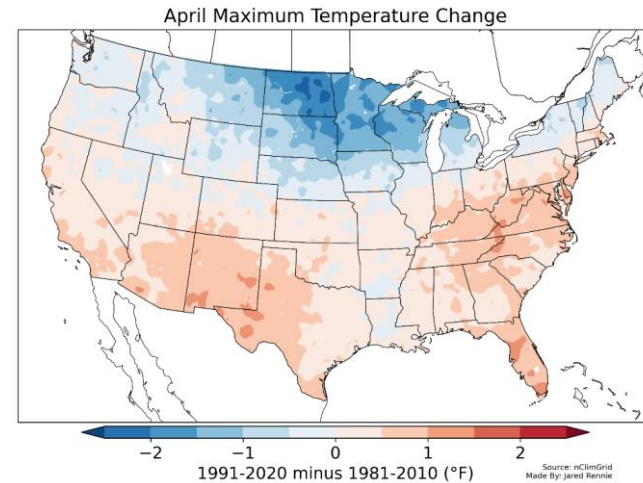
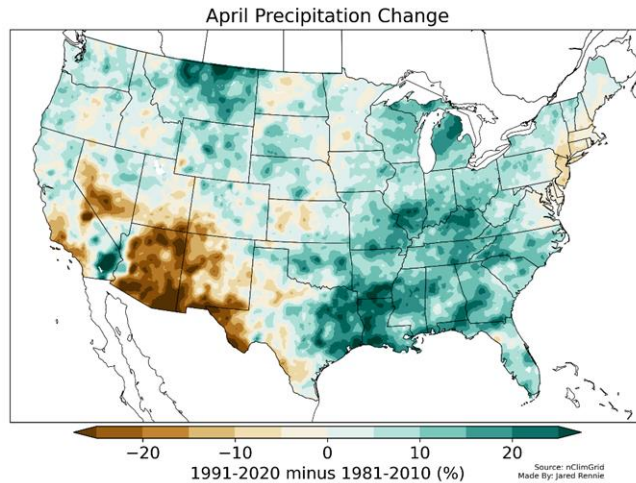
Included in the Normals

- Overview:

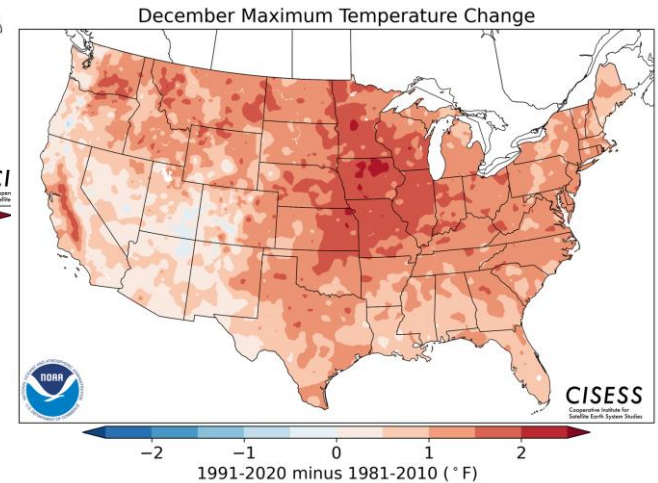
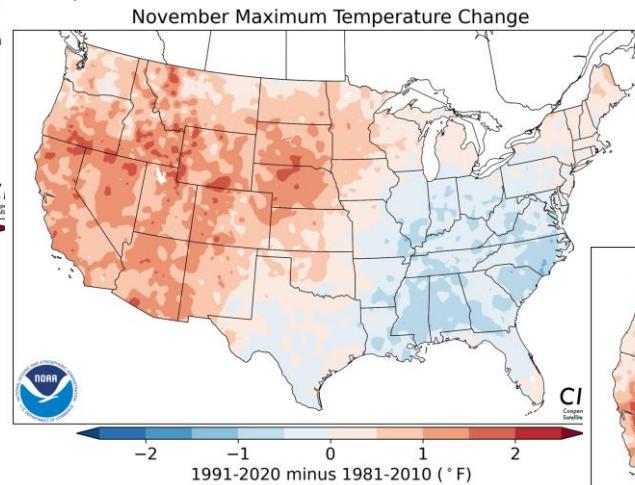
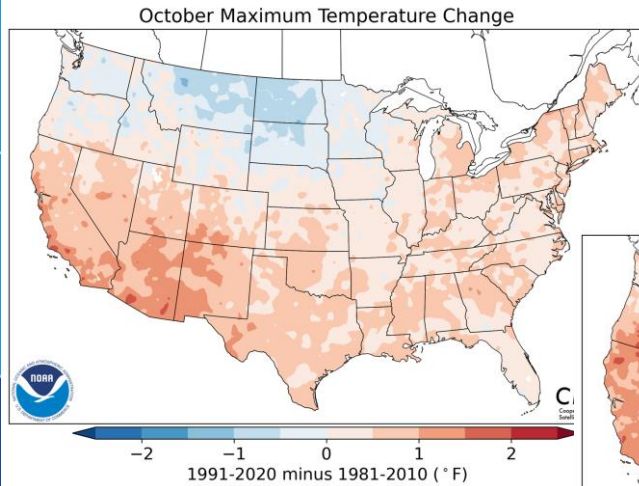
- Annual/seasonal/monthly/daily: temperature, precipitation, snow
- Hourly: temperature, dew point, sea level pressure, clouds, wind
- Averages, degree days, counts/frequencies, growing season, terciles, quartiles, quintiles



Example: April Changes New-Old Normals (1991-2020 minus 1981-2010)

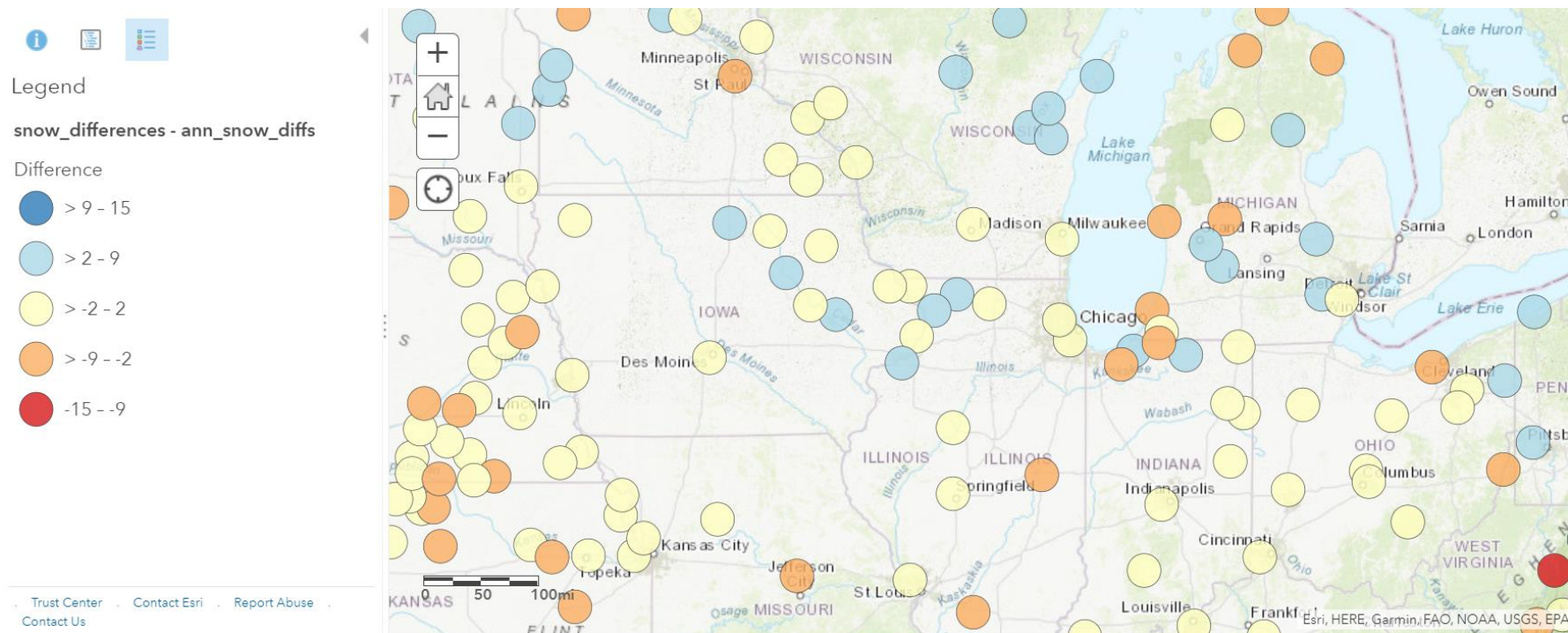


Difference in Normals Vary By Month



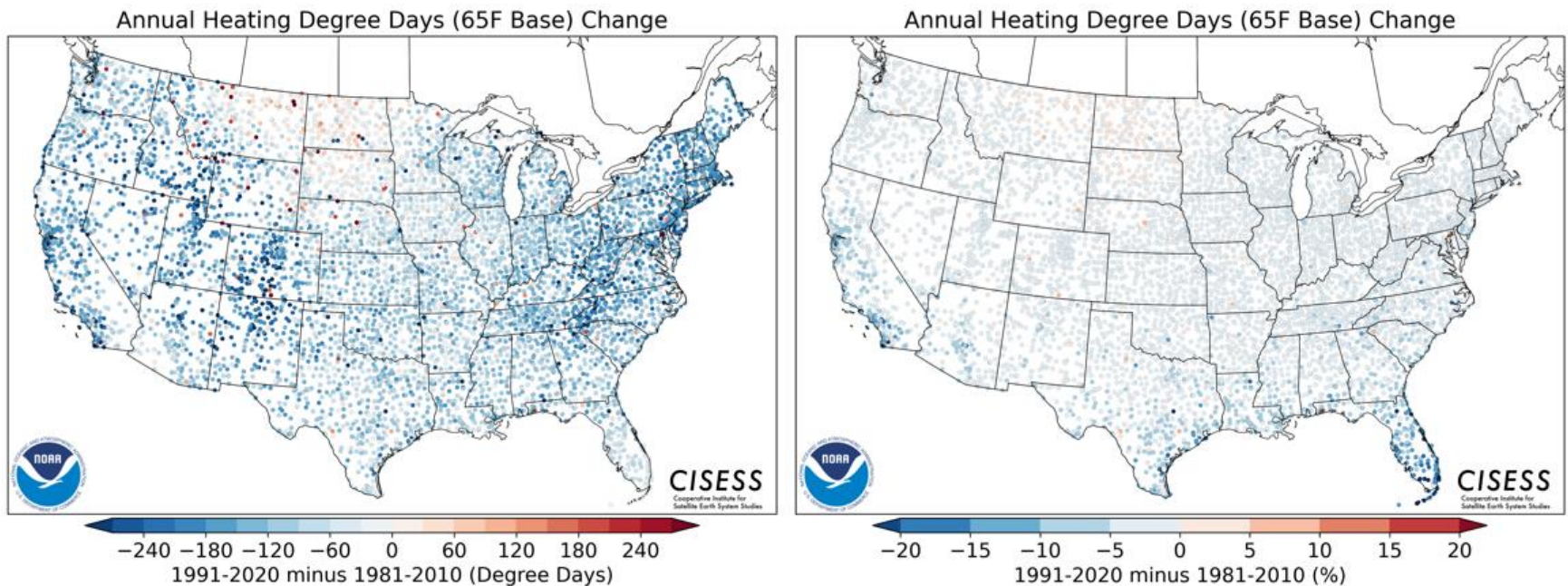
Big shifts in the Southeast normals from October to December

Difference in Annual Snow Normals



Snowfall increased slightly to the north in the Midwest, and decreased to the south.

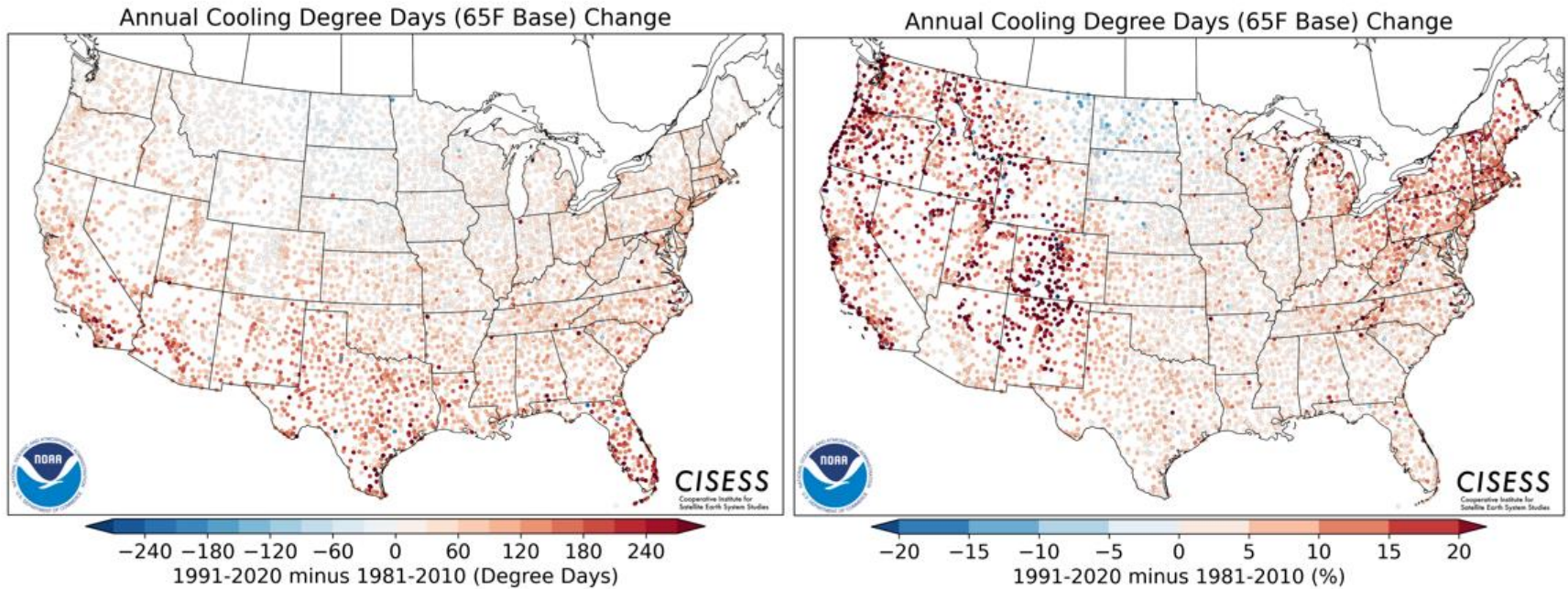
Degree Day Normals Change - HDD



- HDDs are reduced in most of the U.S., generally less than 5%

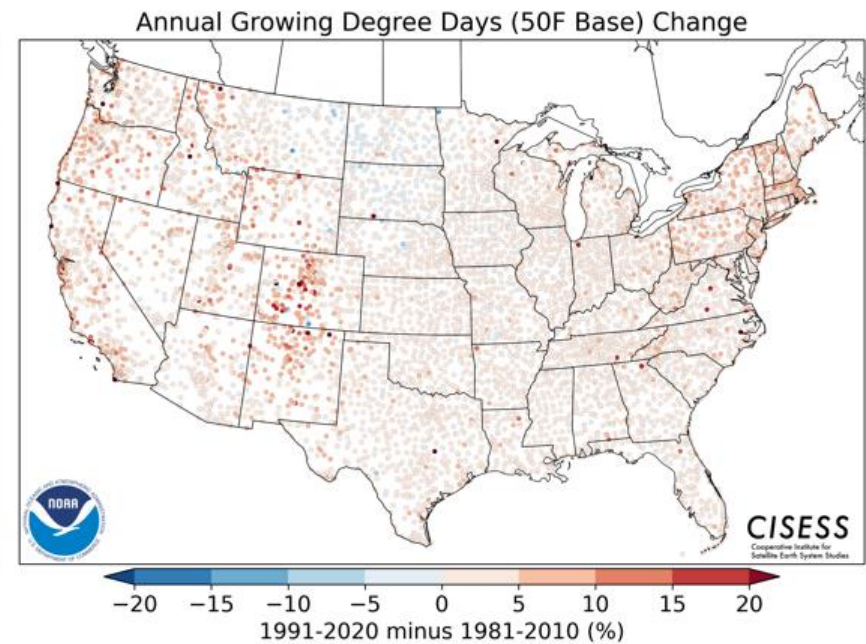
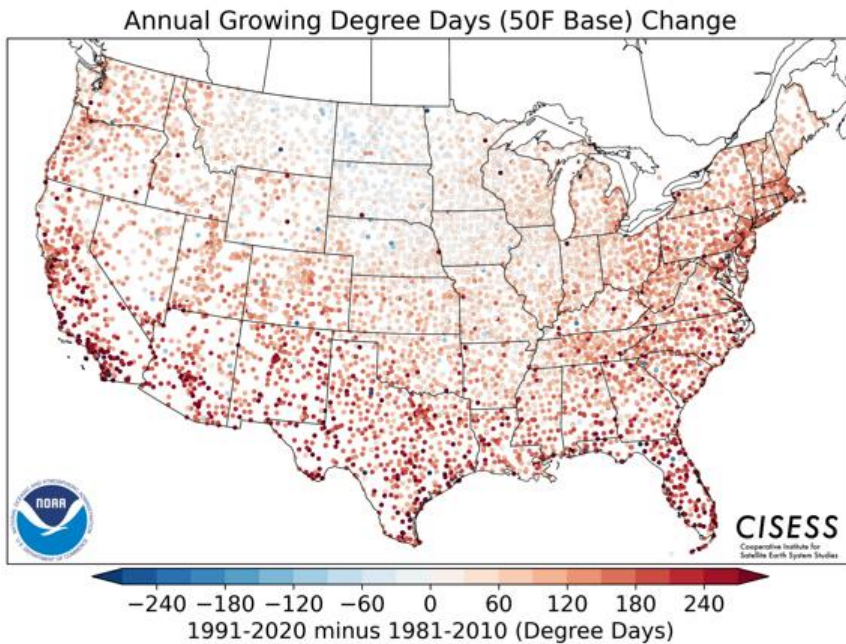


Degree Day Normals Change - CDD



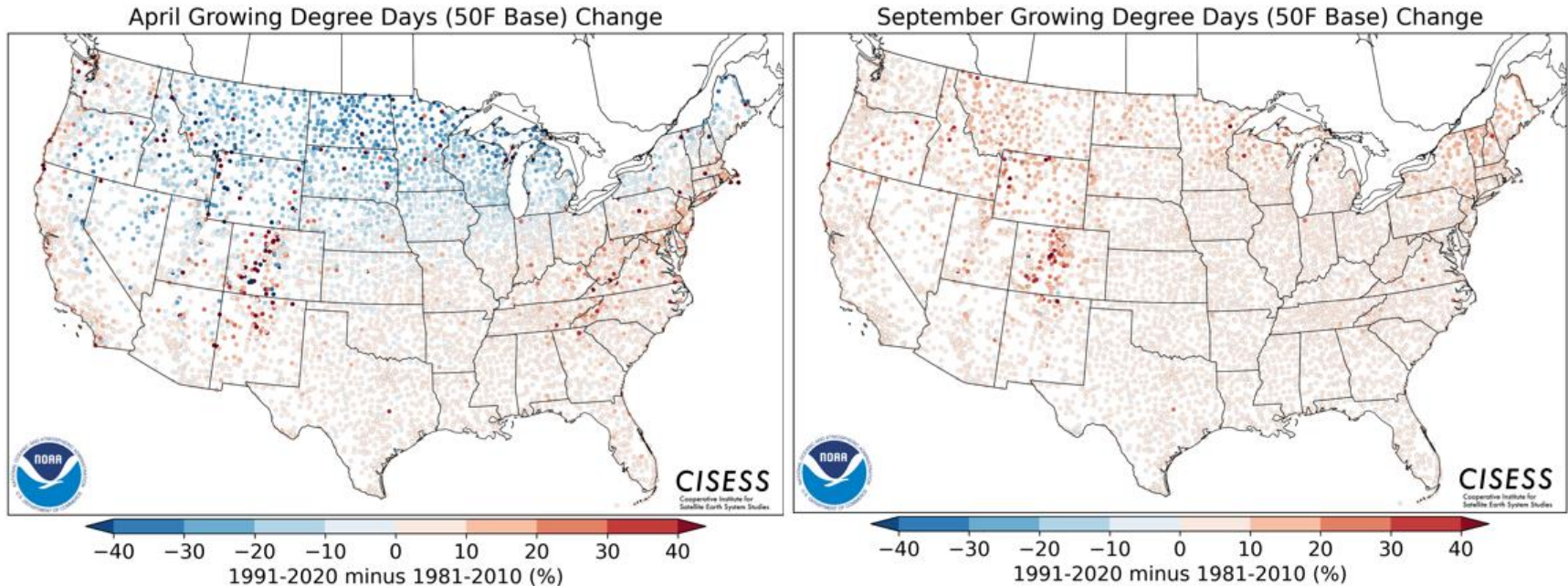
- CDDs are increased in most of the U.S., with changes greater than 10% in most of the West and Northeast

Degree Day Normals Change - GDDs



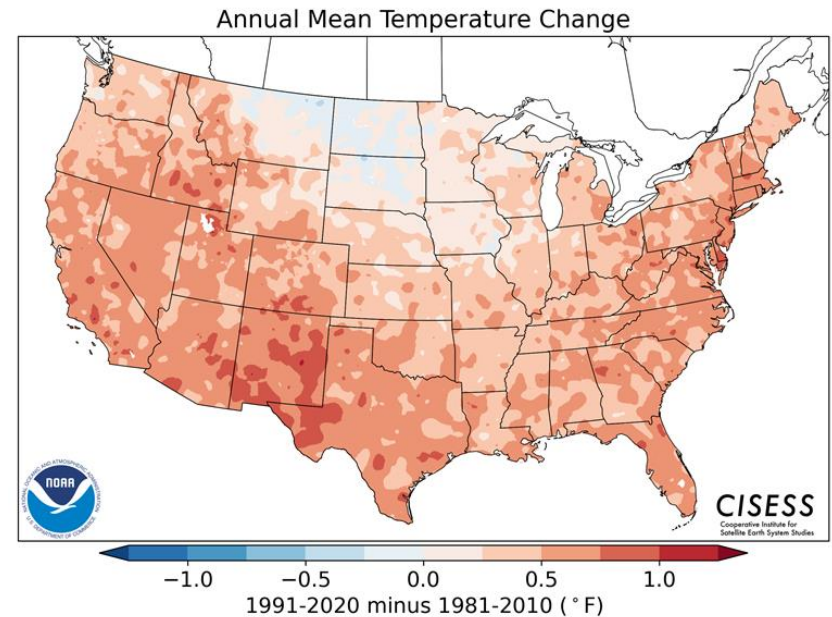
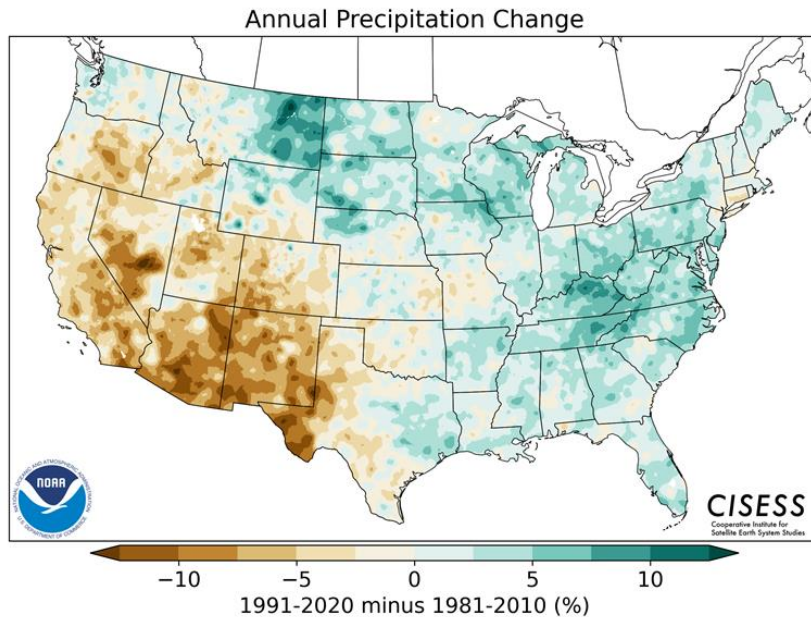
- Annual growing degree days do not change much in the north central U.S., with small increases elsewhere by percentage.

GDD changes in early and late growing season



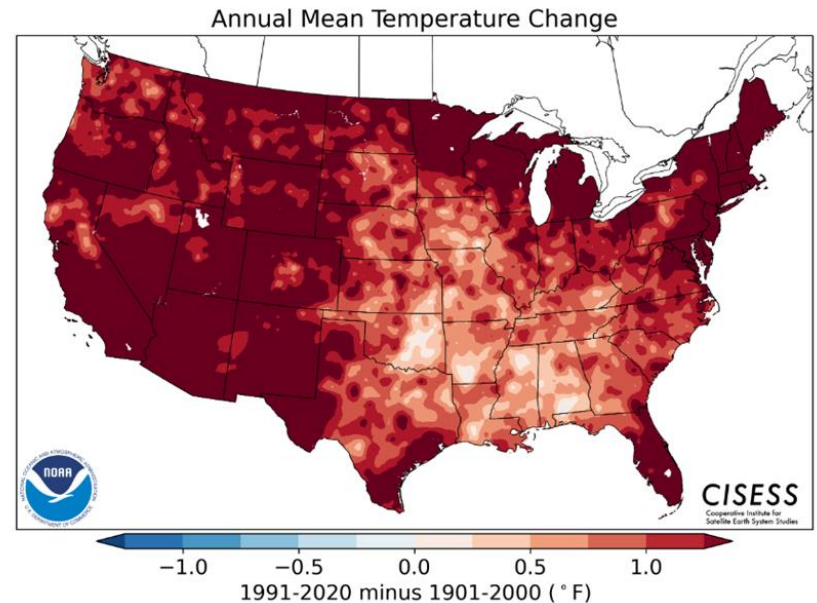
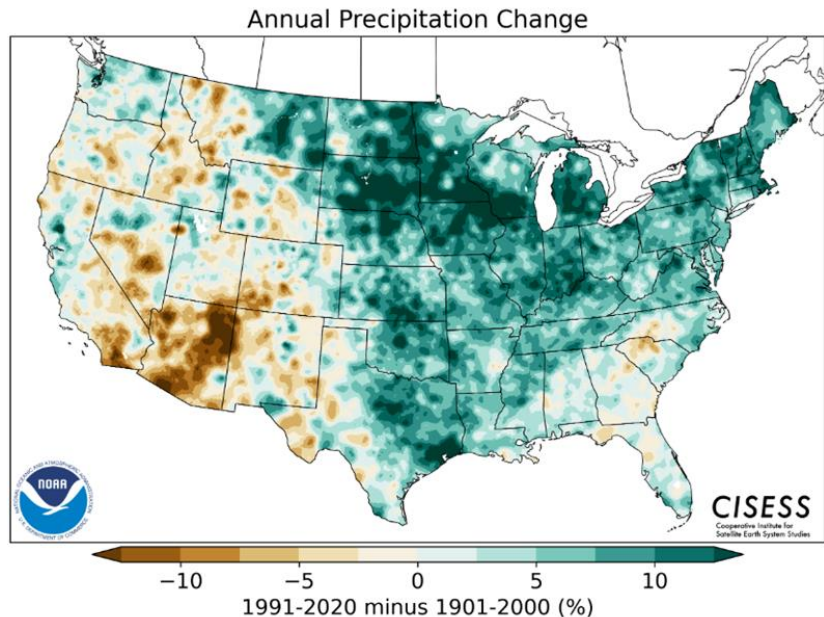
- Growing season is shifting toward the fall in the northern central U.S.

10-Year Annual Normals Change



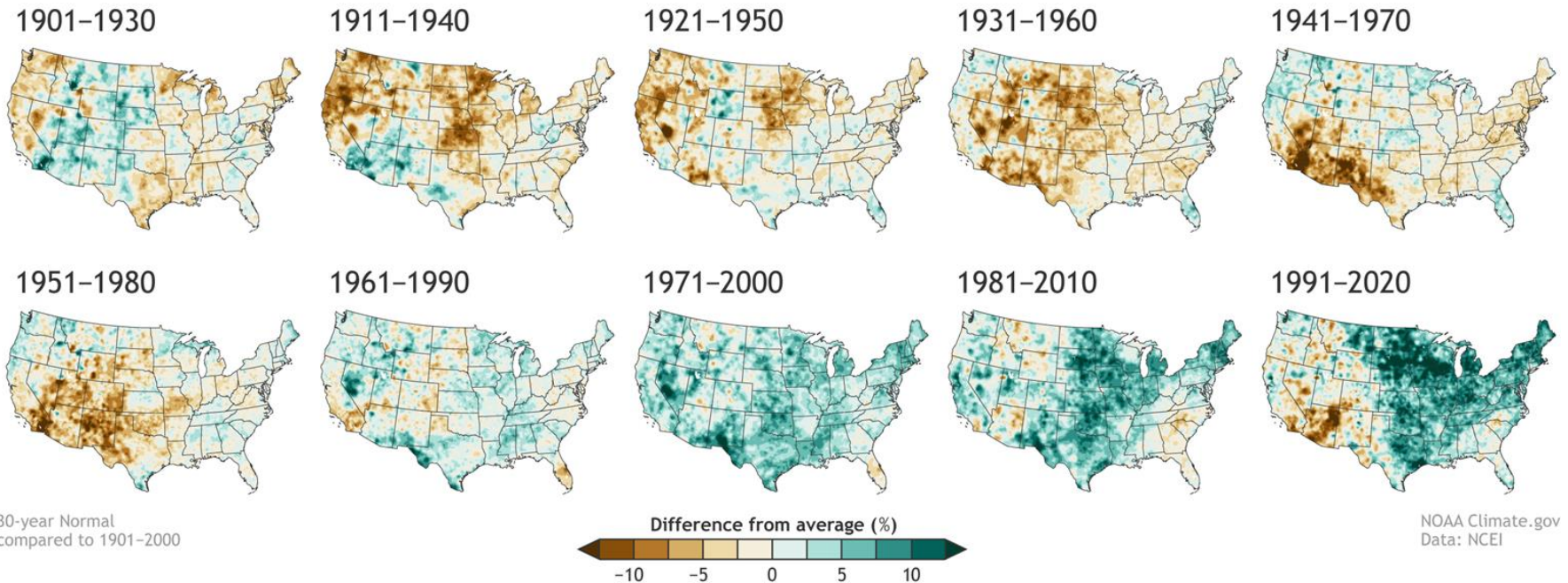
- Wetter in the central and eastern U.S., drier in the Southwest
- Warmer everywhere except the north central U.S.

Comparing 1991-2020 to 1901-2000



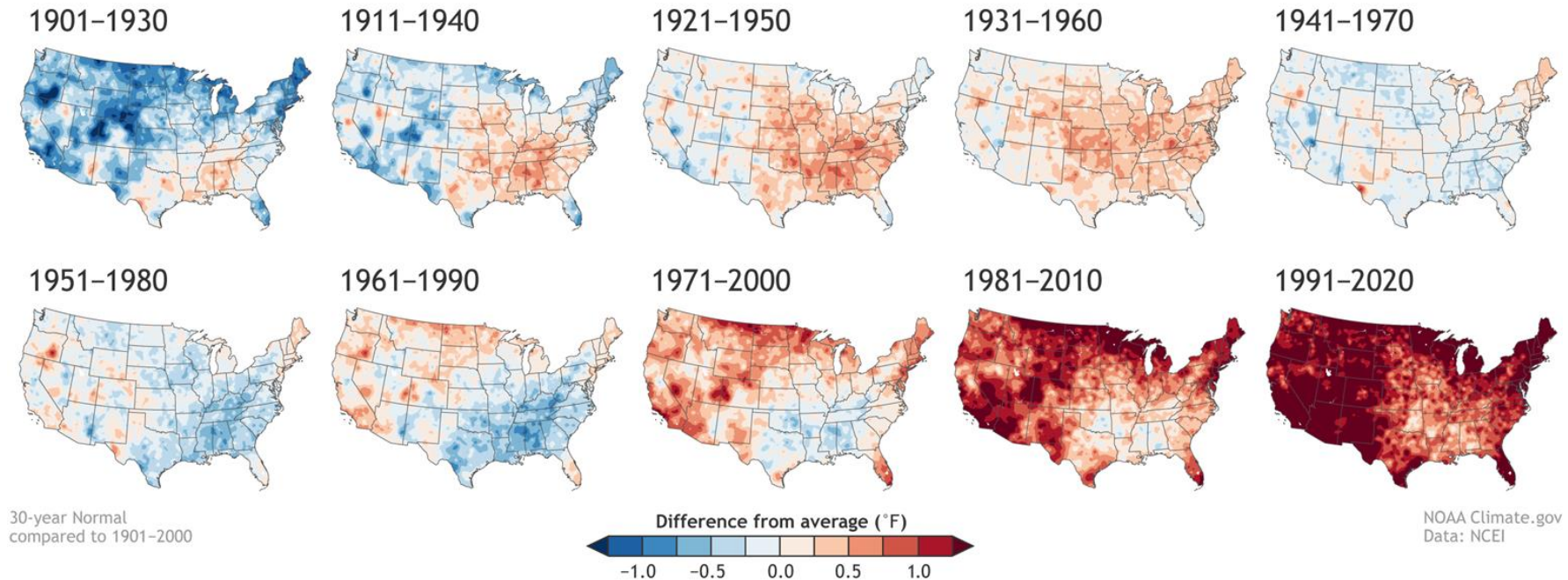
- Climate change is clearly seen in comparing the new normals to the Twentieth Century averages

Annual Precipitation Normals since 1901 compared to the 20th Century Average



- Climate change is coming into focus in recent normals.

Annual Temperature Normals since 1901 Compared to the 20th Century Average



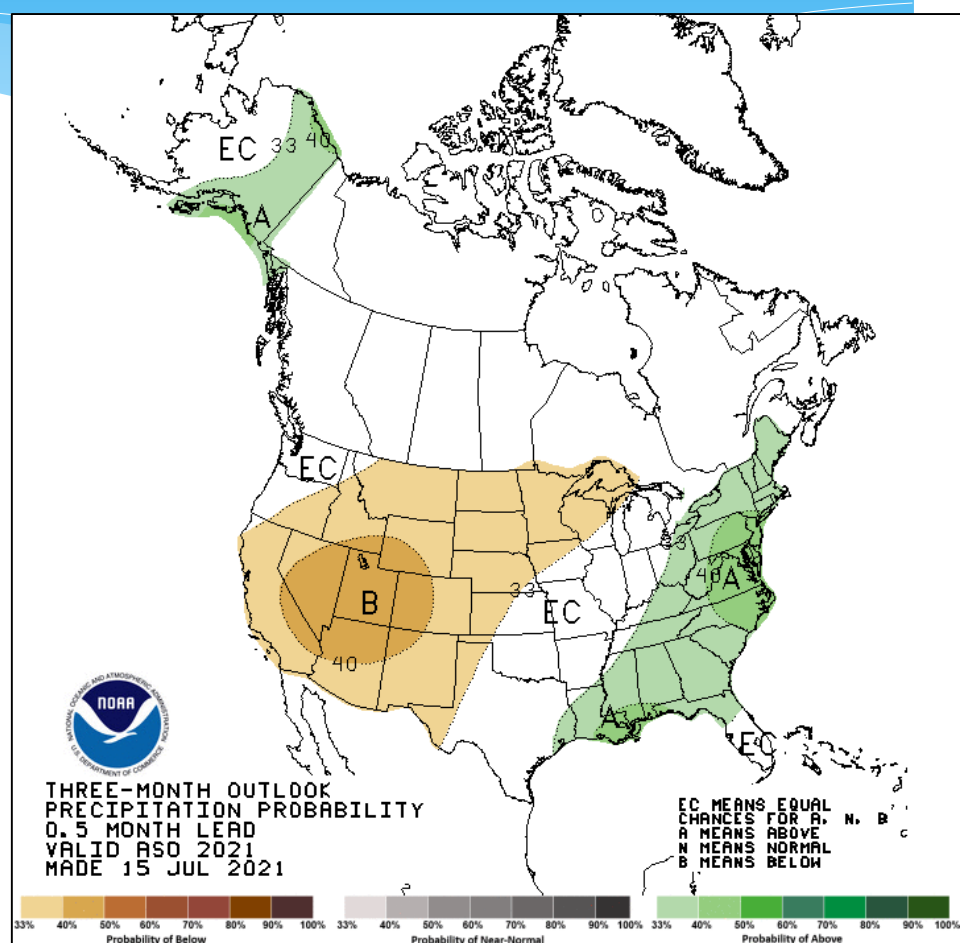
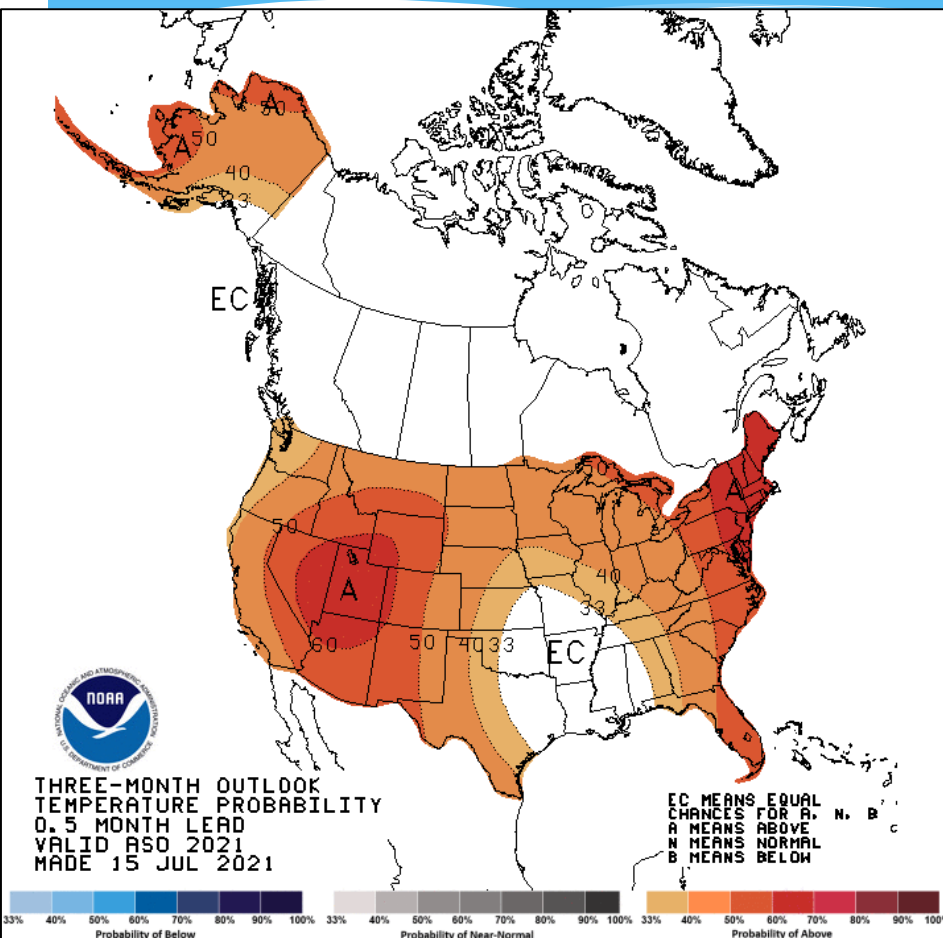
<https://www.climate.gov/news-features/understanding-climate/climate-change-and-1991-2020-us-climate-normals>

Thanks

- * **Michael Palecki, Ph.D. (michael.palecki@noaa.gov)**
 - * (new) Normals Project Manager
 - * NOAA National Centers for Environmental Information
 - * <https://www.ncei.noaa.gov/products/us-climate-normals>
- * **Climate Resilience Toolkit:** <https://toolkit.climate.gov/>
 - * **Climate Explorer:** <https://crt-climate-explorer.nemac.org/>
- * **Climate.gov:** all things climate and NOAA related
- * **Weather.gov:** real time weather forecasts, warnings and outlooks
 - * **Climate outlooks:** <https://www.cpc.ncep.noaa.gov/>

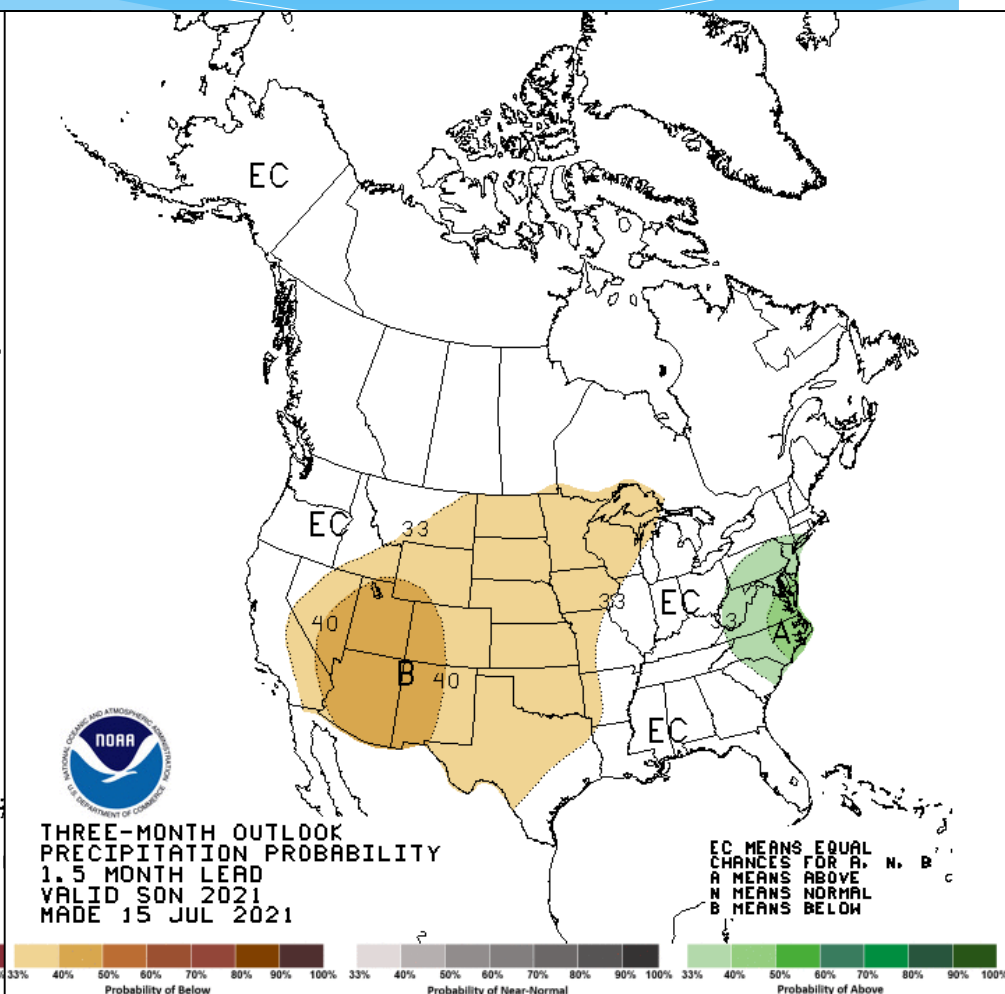
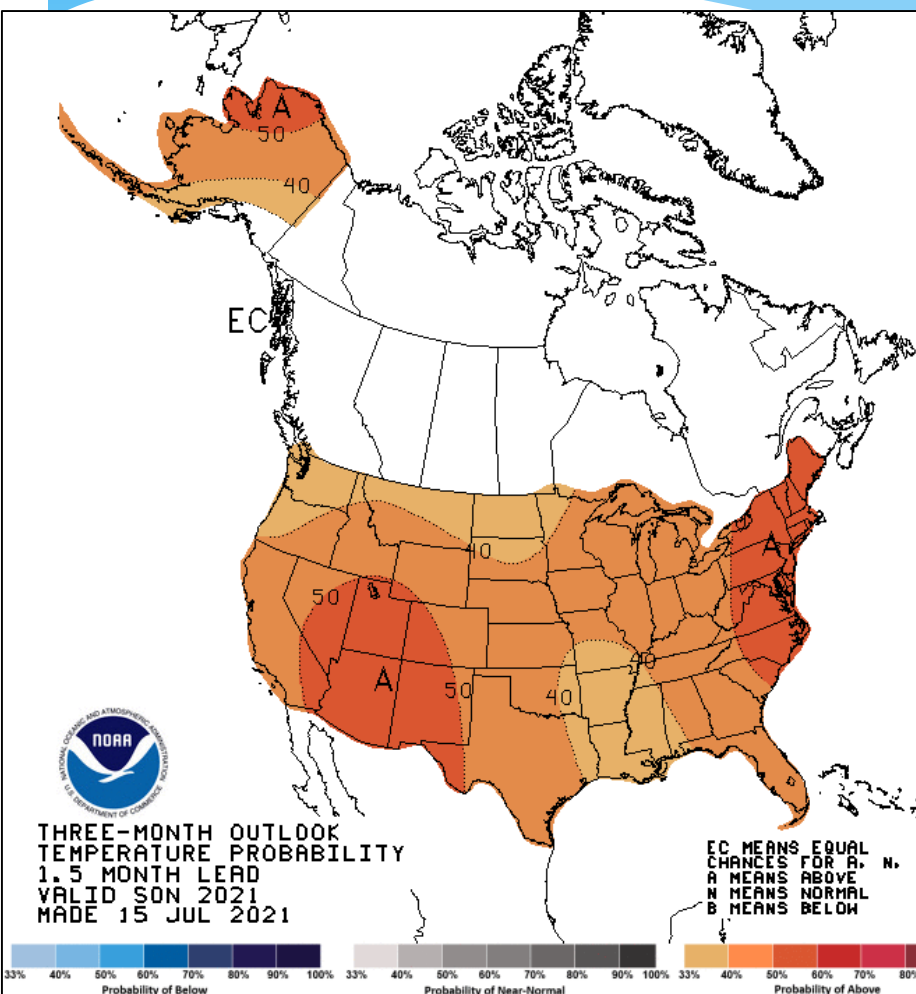
Outlook Probabilities (Aug – Oct)

Temperature & Precipitation



Outlook Probabilities (Sep - Nov)

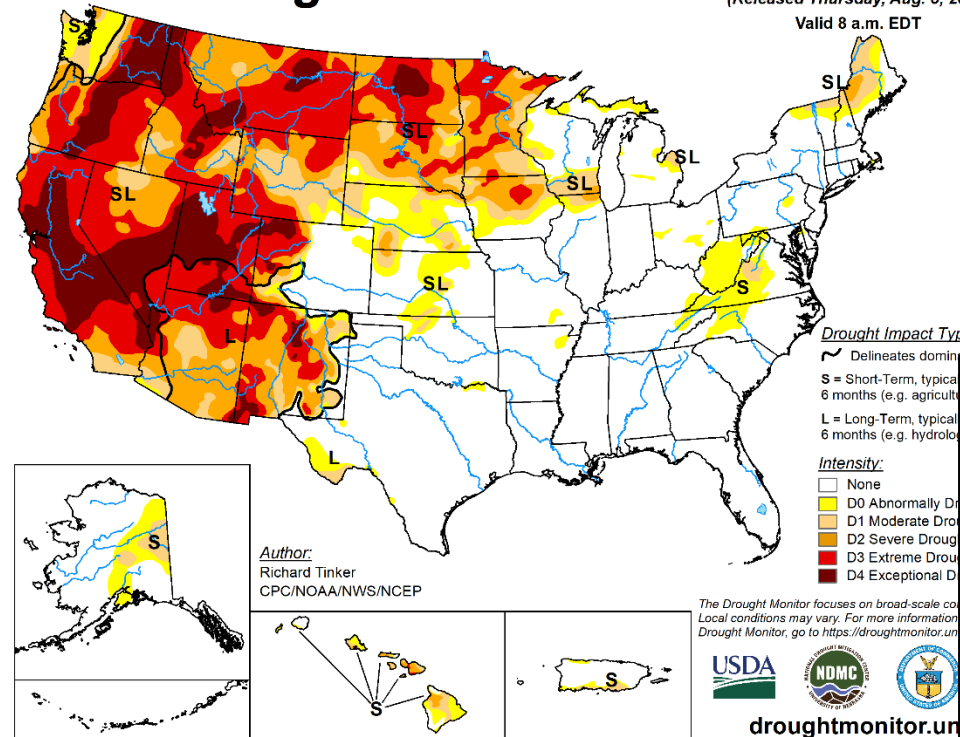
Temperature & Precipitation



Drought Update

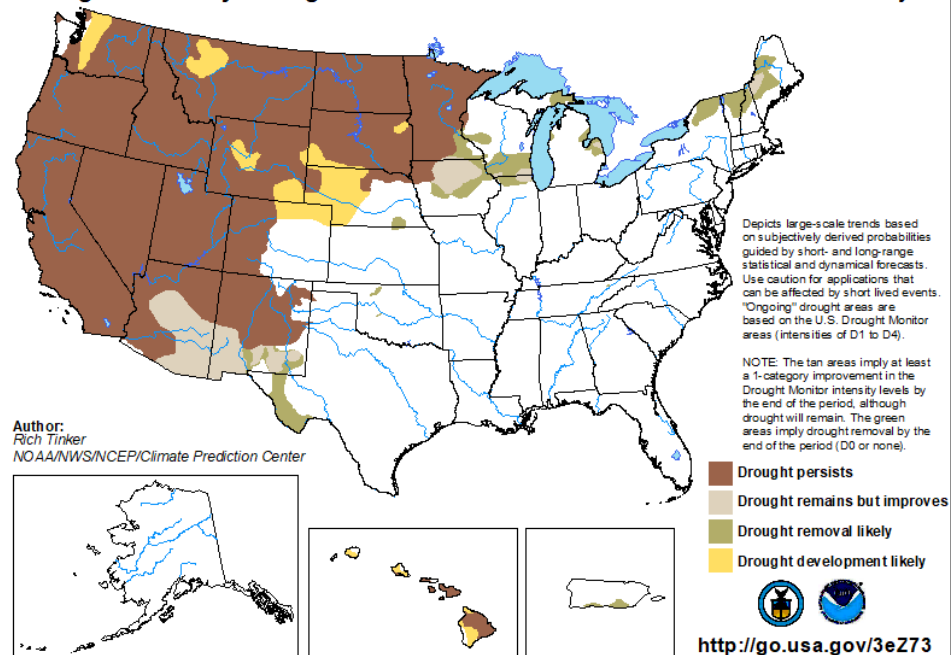
U.S. Drought Monitor

August 3, 2021
(Released Thursday, Aug. 5, 2021)
Valid 8 a.m. EDT




U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for July 15 - October 31, 2021
Released July 15




The Climate Explorer

 The Climate Explorer

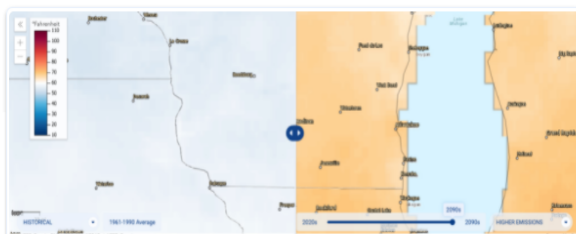
 About the data



 Topeka, KS

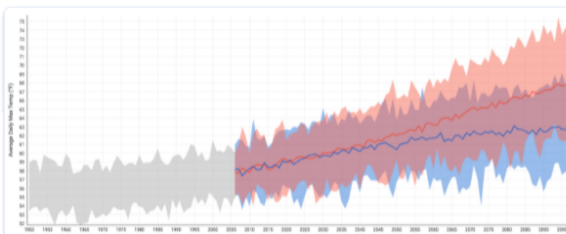


 Select one of the following for Shawnee County



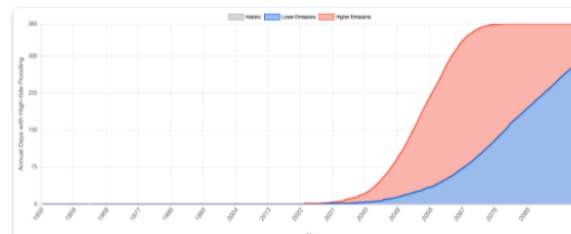
Climate Maps

Compare past and projected future conditions in your county.



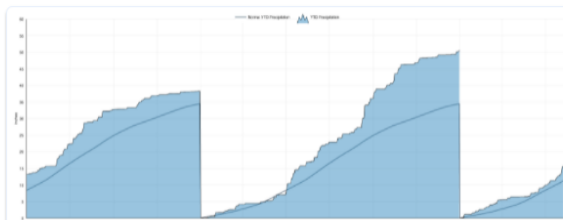
Climate Graphs

Check past and projected values for climate variables.

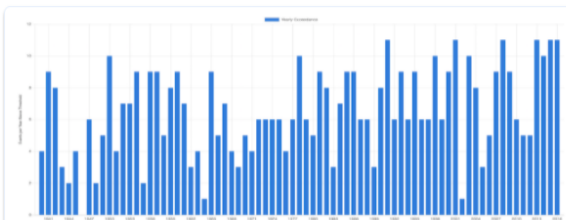


High-Tide Flooding

Explore the number of days per year with high-tide floods.



Historical Weather Data



Historical Thresholds

Check how often temperature or precipitation has exceeded your defined



Ready to plan for resilience?



Resources from our partners can help you identify what matters to your community and evaluate how climate change could affect it:

- Check your exposure to extreme events such as wildfires and flooding
- Identify social vulnerabilities across urban areas
- Get step-by-step guidance for completing a vulnerability assessment or crafting an action plan.

Region Based

Station Based

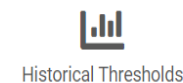
 Cards Home

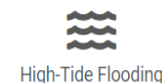
 Take action

 Climate Graphs

 Climate Maps

 Historical Weather Data

 Historical Thresholds

 High-Tide Flooding

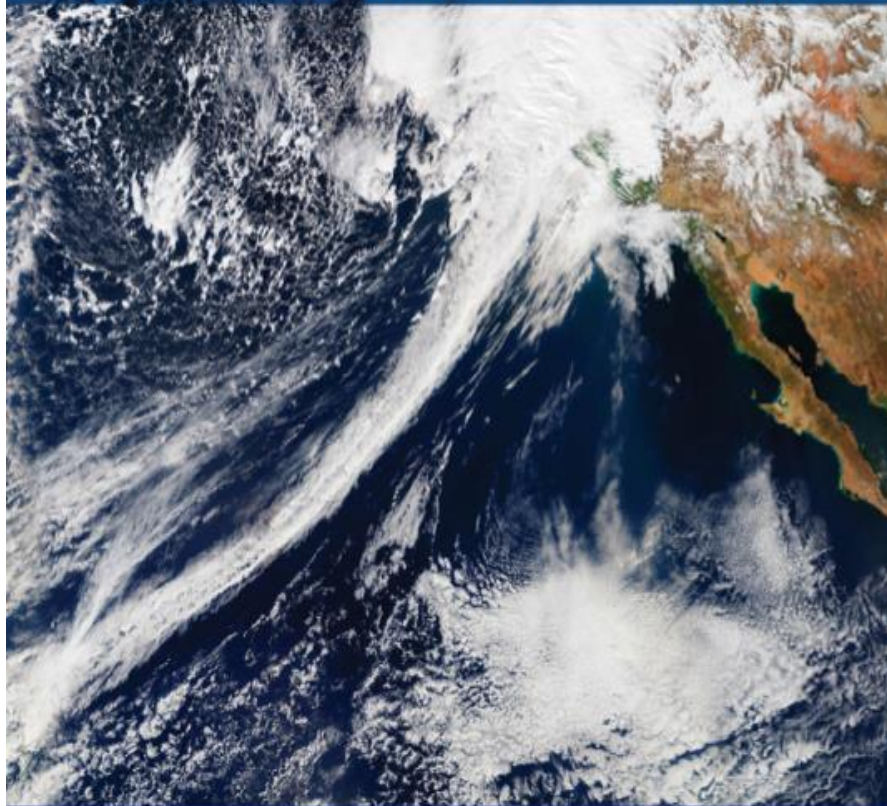


2017



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CLIMATE SCIENCE SPECIAL REPORT



Fourth National Climate Assessment | Volume I



U.S. Global Change
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Fourth National Climate Assessment, Vol II — Impacts, Risks, and Adaptation in the United States

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Fourth National Climate Assessment



Volume II

Impacts, Risks, and Adaptation in the United States

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